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JAPANESE [JP,2000-316035,A]

CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE INVENTION TECHNICAL PROBLEM MEANS DESCRIPTION OF DRAWINGS DRAWINGS CORRECTION OR AMENDMENT

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CLAIMS

[Claim(s)]
[Claim 1] In the wireless communication system which has a base station and at least one mobile station said base station Operate so that a communication link with at least one mobile station may be established, and this communication link has two or more channel and two or more data rate modes. a. The step which measures the data rate of transmission on the communication link to the given user based on the measured value of the data in a data buffer, b. As opposed to said given user among said two or more data rate modes [from] How to choose the data rate mode in the communication link to the given user characterized by having the step which chooses sufficient data rate to support the data rate of the measured communication link.
[Claim 2] Said steps a and b are approaches according to claim 1 characterized by being repeated about said given user so that said at least one channel and data rate chosen may be adjusted dynamically based on change of the measured value of said data buffer.
[Claim 3] Said steps a and b are approaches according to claim 1 characterized by being repeated over almost all the mobile stations in said system.
[Claim 4] It is the approach according to claim 1 which, as for this forward direction link, said communication link has a control channel and a traffic channel including a forward direction link, and is characterized by this control channel operating so that control command and traffic data may be transmitted.
[Claim 5] Said forward direction link is an approach according to claim 4 characterized by being chosen so that it may have sufficient capacity to support the data rate chosen.
[Claim 6] It is the approach according to claim 1 which, as for this hard flow link, said communication link has a control channel and a traffic channel including a hard flow link, and is characterized by this control channel operating so that control command and traffic data may be transmitted.
[Claim 7] Said hard flow link is an approach according to claim 6 characterized by being chosen so that it may have sufficient capacity to support the data rate chosen.
[Claim 8] Said data buffer is an approach according to claim 1 characterized by including the input data buffer which receives data through said communication link.
[Claim 9] The measured value of the data in said input data buffer is an approach according to claim 8 characterized by what it opts for to a known threshold limitation.
[Claim 10] Said threshold limitation is an approach according to claim 9 characterized by including two or more predetermined thresholds corresponding to said two or more data rate modes.
[Claim 11] Said data buffer is an approach according to claim 1 characterized by including the output data buffer which receives data through said communication link.
[Claim 12] The measured value of the data in said output data buffer is an approach according to claim 11 characterized by what it opts for to a known threshold limitation.
[Claim 13] Said threshold limitation is an approach according to claim 12 characterized by including two or more predetermined thresholds corresponding to said two or more data rate modes.
[Claim 14] Said communication link is an approach according to claim 1 characterized by being

established by the CDMA method.
[Claim 15] In the approach of assigning channel capacity accommodative with the wireless communication system which has at least one base station and at least one mobile station which communicates with this base station through a communication link a. The step which starts a data communication stream by the low-speed channel of said communication link between said at least one base station and one mobile station, b. The step which measures the data rate received by the data buffer from the source of said data communication stream, c. The step which chooses [from] sufficient data rate to support the measured data rate among two or more data rates, d. How to assign channel capacity accommodative with the wireless communication system characterized by having the step which assigns the selected data rate to said data communication stream.
[Claim 16] Said selected data rate is an approach according to claim 15 characterized by being dynamically adjusted based on change of the measured value of said data buffer by repeating said step a-d about said one mobile station.
[Claim 17] Said step a-d is an approach according to claim 15 characterized by being repeated over almost all the mobile stations in said system.
[Claim 18] It is the approach according to claim 15 characterized by operating so that, as for this forward direction link, said communication link may have a control channel and a traffic channel including a forward direction link, this control channel may be arranged as said low-speed channel and control command and traffic data may be transmitted.
[Claim 19] Said forward direction link is an approach according to claim 18 characterized by being chosen so that it may have sufficient capacity to support said selected data rate.
[Claim 20] It is the approach according to claim 15 characterized by operating so that, as for this hard flow link, said communication link may have a control channel and a traffic channel including a hard flow link, this control channel may be arranged as said low-speed channel and control command and traffic data may be transmitted.
[Claim 21] Said hard flow link is an approach according to claim 20 characterized by being chosen so that it may have sufficient capacity to support said selected data rate.
[Claim 22] Said data buffer is an approach according to claim 15 characterized by including the input data buffer which receives data through said communication link.
[Claim 23] The measured value of the data in said input data buffer is an approach according to claim 22 characterized by what it opts for to a known threshold limitation.
[Claim 24] Said threshold limitation is an approach according to claim 23 characterized by including two or more predetermined thresholds corresponding to said two or more data rate modes.
[Claim 25] Said data buffer is an approach according to claim 15 characterized by including the output data buffer which receives data through said communication link.
[Claim 26] The measured value of the data in said output data buffer is an approach according to claim 25 characterized by what it opts for to a known threshold limitation.
[Claim 27] Said threshold limitation is an approach according to claim 26 characterized by including two or more predetermined thresholds corresponding to said two or more data rate modes.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to carrying out the monitor of the signal data rate to data service, and assigning it dynamically in such a system, especially, about a wireless communication mode.
[0002]
[Description of the Prior Art] In order to make it possible to transmit an information signal between a dispatch (source) location and a destination (destination) location, the wireless communication mode is developed. In order to transmit such an information signal through the communication channel which links a dispatch location and a destination location, the analog (the 1st generation) and the digital (second generation) method have been used. The digital method is more advantageous than an analog form. For example, the encryption for the high resistance over the noise of a channel or interference, large capacity, and a safe (security is high) communication link is a point with an advantageous digital method compared with an analog form.

[0003] Although the method of the 1st generation mainly aimed at voice communication, the method of the second generation supports application of both voice and data. In the second generation method, some techniques for treating the data transmission which has various transmission requirements are known. Especially, in packet data transmission, to general comparatively short one, voice transmission has a long period and a transmission period needs continuous access to a communication channel. In order to increase the number of accessible users to a wireless network, some modulation/coding methods are developed, for example, there are Frequency Division Multiple Access (FDMA), time division multiple access (TDMA), and code division multiple access (CDMA). A CDMA method has the resistance over multi-pass distortion or common channel interference rather than an FDMA method or a TDMA method, and the burden of a frequency/channel plan common to an FDMA method or a TDMA method is mitigated.
[0004] By the CDMA method, since a user is identified uniquely and a user's signal is diffused covering wide band width of face, the binary sign sequence of a proper is assigned to each active user in a cel. The assigned sign can multiply by a user's signal and it is diffused in the whole channel bandwidth larger than a user's signal bandwidth. The ratio to the user bandwidth of system channel bandwidth is called "diffusion gain" of a system. The capacity of a CDMA system is proportional to "diffusion gain" to the given signal pair interference (S/I) level. After receiving the transmitted signal, each user's signal is separated from other users' signal by using the correlator by which keying is carried out by the sign sequence of a desired signal (back diffusion of electrons).
[0005] The analog form of the 1st generation and the digital method of the second generation were designed so that voice communication might be supported with the limited data communication capacity. It is expected that the wireless method of the third generation will treat effectively various services like voice, video, data, and an image using a broadband point-to-multipoint connection technique like CDMA. The inside of the function supported by the third

generation method has high-speed-data transmission between a migration terminal and a land communication-wire network. High-speed data transmission is often characterized as short transmission "a burst" at a high data transmission rate by most or a little long period which is not by the transmission activity from a data source following it as known.
[0006] In order to cope with the burst nature of such high-speed data service in a third generation method, communication system needs to assign a large (it corresponds to a high data rate) bandwidth segment during the period of an occasional data burst. Since a third generation method can treat high-speed-data transmission of such burst nature, it can improve the throughput and delay to a user, and is advantageous. However, since the momentary bandwidth required of transmission of a high-speed-data burst is large, it must treat carefully so that an unjust interference with service of the others which use management of such a burst and the frequency allocation especially with the same allocation of power and a system resource may be avoided.
[0007] Naturally in the wireless system which can transmit a large data block, the highest data rate will be assigned to a bulk transmission user. If a data rate doubles, since only the one half of time amount until it completes transmission is less necessary, the time amount which transmits a user's data will become min by assigning such a user the highest data rate. However, the need over the resource of a base station also grows as the number of users increases and the information transmitted moves from voice to multimedia (a real-time image and voice). In order to offer service of level permissible to the whole user and to guarantee that there is sufficient capacity, communication system is efficient and must be able to assign a system resource dynamically by the high approach of cost effectiveness. Adjusting the data rate of a user's class in a multiuser signal environment is indicated by U.S. Pat. No. 5,857,147 (artificer: others [Gardner]) so that all permissible signal qualities may be maintained for every class of a user.
[0008] If a new user demands the entry to a wireless network, the base station of communication system must determine a resource required to hold a demand of the user, and must assign a user the resource. When sufficient resource to hold the user is not available, a base station must postpone establishment of connection with a user, and a user has to wait for it until sufficient resource becomes available.
[0009] There are output power and a data rate in the resource which must be assigned in case a base station establishes the communication link to a user. Output power and a data rate are in proportionality. That is, output power required to establish and maintain a link with a user increases while a data rate increases. It is required in order that it may maintain the output energy per bit on fixed level that output power increases in this way with increase of a data rate. Since the output-power resource of a base station is limited, individually, it must collect and a base station must balance an output-power limit of the base station, and a transmission demand of a user.
[0010]
[Problem(s) to be Solved by the Invention] Therefore, if there is a demand of the entry to the wireless network by the user, a base station must evaluate a user's data rate and a power demand to the present user environment and a power demand. If a user environment approaches total system capacity, as for a base station, the entry of the user to a system is postponed, and it must be made for the output-power capacity of a base station not to have to become an overload. For example, the base station which is processing two or more users who demand a respectively high data rate may be unable to accept the demand of access by the user of an additional low data rate. It is the case where there is only no power which fills a demand of the low data rate user of the addition in the base station. Lack of this power may be based on excessive consumption of the power relevant to inefficient allocation of a data rate to a user rather than was caused by the number of the users in a system. Assigning a user a data rate sharply higher than a thing required to fill the demand of a user's instancy wastes a system resource, and in case the number of the users in whom concurrent access is possible to a system is decreased and is accessed in a network, it increases the delay which a user receives. Therefore, in order to provide a user with the minimum data rate and to offer the reduced power to which that it is only enough to fill a transmission demand of a user corresponds, to manage

the resource of a base station efficiently and to use it is needed.
[0011]
[Means for Solving the Problem] The purpose of this invention is assigning the transmission data rate of a wireless system efficiently by determining a transmission demand of a user dynamically during an active data session. Another purpose of this invention is adjusting transmission data dynamically by carrying out the monitor of the transmission data buffer during an active data session. Another purpose of this invention is adjusting dynamically the assigned transmission data rate indispensable filling a demand of a user, and managing it.
[0012] Using the low-speed channel (for example, control or a signaling channel) of a fixed rate, this invention transmits the user data to the data rate of a channel, and further, in order to fill a transmission demand of a user, it operates so that the time of having to use high speed datalink may be determined. In case this function is performed, this invention carries out the monitor of the amount of the data in a transmitting data buffer and a receive data buffer during an active data session. The monitor of each buffer is separately carried out for each [its service is given by the base station] active user of every, respectively. If the amount of the data in transmission or a receive buffer exceeds a predetermined threshold, a high-speed data rate can be set up using an auxiliary data channel, and a base station can manage a data buffer within a regular threshold level. Similarly, when the level of the data in a data buffer is less than a desired threshold level (this shows that it is higher than what has the data rate required for a user currently offered), a low-speed data rate is used. In this way, the minimum data rate required to transmit data between a base station and the user of a remote site is assigned to each user.
[0013]
[Embodiment of the Invention] The core of an early wireless method, especially the 1st generation analog form was mainly voice communication. There was an improvement of various extent about voice quality, network capacity, and advanced service with second generation wireless methods, such as CDMA, TDMA, and GSM. However, although the second generation method is suitable for voice, low rate data, facsimile, and offer of messaging, generally it cannot cope with the demand of a mobile high-speed data rate effectively and efficiently. The progress to a third generation wireless communication link can essentially express the paradigm shift to the world of multimedia mobile communications, and a user can access not only voice service but video, an image, a text, a graphic, and data communication. It is expected that a third generation network provides a mobile user with the data rate of 144Kbps - 2Mbps.
[0014] Nevertheless, in the wireless network which supports such high-speed-data-transmission application, in order to avoid the service refusal by unsuitable allocation of the bandwidth between such applications, and power, bandwidth and power control must be managed very carefully. This invention offers the new method of improving effectiveness of operation and reducing establishment of service refusal by improving management of the power about such high-speed-data application, and bandwidth so that it may explain below. Below, in the case of the desirable example based on CDMA coding of a wireless signal, this invention is explained, but the ** kana of the ability of the approach of this invention to be applied to other wireless channelization configurations, such as TDMA and GSM, is **.
[0015] The typical wireless communication system configuration which contains in drawing 1 the mobile communication exchange center (MSC:Mobile Switch Center) 100, two or more base station controllers (BSC:Base Station Controller) 102, two or more base transceiver offices (BTS:Base Transceiver Station) 104, and two or more remote users that operate a mobile station (MS:Mobile Station) 106, respectively is shown. In addition to offering management and a control function for the component of a wireless network, MSC100 offers the interface between a wireless network, a cable network (PSTN110), or another wireless network (MSC120). BSC102 offers control and a function manager to one or more BTS(s)104. BTS104 consists of a set of the transceiver in which remote adjustment is usually possible arranged to the wireless site, and is the terminal point of the wireless path by the side of a network. As shown in drawing 1 , generally each BTS104 performs the remote user and radio in a cel on behalf of one cel 108 in a wireless network. Cell sizes may differ in a network according to the user consistency expected in each cel. Although the cel which has activation hippo REJIERIA of hundreds of feet (30-300

meters) order is set up in the field where population density is high, cell size can be enlarged all the time in the field where population density is low. Moreover, this cell size determines the power capacity of BTS104. It is because larger output power than a small cel is needed, so that a cel becomes large.

[0016] A mobile station 106 (for example, a cellular phone machine, a computer terminal, or a facsimile machine) carries out termination of the wireless path from BTS104, and offers access to a network service to the user served. According to a practice, the bidirectional radio link between BTS104 and MS106 is called forward channel, when BTS104 transmits to a mobile station 106, and when MS106 transmits to BTS104, it is called backward channel.

[0017] The CDMA forward-channel multiplexing configuration decided to drawing 2 by the present version of TIA/EIA / 2000.IS-2 criterion is shown. A pilot channel (PCH:Pilot Channel, 201) operates so that an unmodulated signal may be continuously transmitted in a CDMA system. PCH offers the phase criteria for a coherent modulation, and the means of the signal strength comparison between BTS(s). An exclusive control channel (DCCH:Dedicated Control Channel, 202) is used in order to transmit digital control information (power control information is included) to MS from BTS. A basic channel (FCH:Fundamental Channel, 203) transmits the data of a high level, and the combination of power control information. An auxiliary channel (SCH:Supplemental Channel, 204) acts with DCCH or FCH, and the high data rate service (or burst data transfer) which transmits high-level data is offered.

[0018] Therefore, using this channel configuration, although the transmission conditions required of voice and data differ greatly, a forward direction traffic channel can be adapted so that the traffic of both voice and data may be transmitted. Once voice transmission is continuous, duration is comparatively long and transmission starts, it will be required that there is no interruption of transmission. If transmission is interrupted, received data are nonpermissible in a receiving side. as for such reception, data are inputted into a receiver -- ** -- it is alike, is processed and evaluates -- having (namely, real-time operation) -- it fragments and is because it comes apart.

[0019] Highly precise voice transmission can be attained by changing voice fluctuation into a digital format and transmitting the digitized voice pattern at 64 kilobits/s (64Kbps). It turns out that digitization at a rate higher than 64Kbps(es) does not improve the voice pattern reproduced further. Therefore, generally an audio transmission rate does not exceed 64Kbps(es). Generally, permissible audio performance and quality are acquired by transmission to the order of 8Kbps.

[0020] On the other hand, generally, data traffic can appear as a train of a pulse, can divide this into a packet, can be transmitted, and can collect and reformat a packet with a receiver. It is in random order, and may be received, and generally a packet is in random order, and is received. A receiver requires resending of a packet with an error, or the discarded packet, and an error and packet loss are compensated. Therefore, data traffic does not impose the need for transmission without interruption to a system. Furthermore, data traffic differs from voice transmission in that it communicates with a sharply different data rate according to the demand of the source and transmission. For example, a facsimile transmission, an electronic mail, and text data can use a low-speed data rate (order of 9.6Kbps) comparatively. It is because a related data quality can generally be transmitted by appropriate time amount also with such a low data rate. However, in order to shorten transmission of the graphics and video like an image on the level which can permit time amount required to transmit a lot of digital data contained in graphics or a video image, a very high data rate is required.

[0021] In consideration of various data transmission demands of a user, the approach of this invention assigns a minimum data rate and minimum corresponding output power, in order to fill a transmission demand of a user. According to this invention, first, if the link between MS106 and BTS104 is established, BTS104 will initialize the parametric data of a forward channel and a backward channel using a low-speed control channel. The forward direction and a backward channel are assigned to each active user in a system. It is uniquely identified by the sign to which any channel is assigned in a CDMA wireless system. The exclusive control channel (DCCH, drawing 2) of a forward channel is used as a control channel. However, this channel can also be used for transmitting low-speed information data.

[0022] According to the approach of this invention, BTS104 initializes a user's and an active data session using DCCH. This DCCH will transmit both control data and information data. In another example of this invention, BTS assigns a low-speed basic channel for an information data bit, and, on the other hand, DCCH is used for a control function.
[0023] While information data are transmitted between BTS and MS, BTS carries out the monitor of the data transmission buffer and data receive buffer which were assigned to each user. By measuring the amount of the data in each buffer, BTS measures the input data rate which supplies information to a transmission buffer and a receive buffer, and confirms that the amount of data remains in a limitation permissible by both transmission (forward channel) of information data, and reception (backward channel). Rather than the rate at which the user supplies data to BTS, when a transmission data rate is late, the amount of data in a buffer will increase across a permissible limitation. If this condition is not amended correctly, the amount of data will exceed buffer size (overflow), and data will be lost.
[0024] If it judges that the approach of this invention has a too quick input data rate, the possibility of an overflow condition is expected and it directs to change a communication link into a high-speed data rate more to BTS. This high-speed data rate can be carried out to one of the rate of the higher one on DCCH or a basic channel, or rates with an available auxiliary channel. The auxiliary channel (drawing 2) of a forward channel can transmit information data at the rate exceeding 1Mbps. Similarly, rather than the rate at which the user supplies data to BTS, when a transmission data rate is quick, the amount of data in a buffer will be less than a permissible limitation, and will decrease. Finally a buffer not only becomes empty (underflow), but on this condition, BTS will consume the superfluous output power for holding that high data rate with a high data rate. Like the response at the time of a data rate being too late when this underflow is expected, this invention directs to use the data rate of the lower (as long as it justifies) one on DCCH, a basic channel, or an auxiliary channel to BTS so that it may correspond to an actual transmission demand of a user.
[0025] By the backward channel, the monitor of the superfluous data rate conditions inadequate in ** again is carried out like actuation of this invention on a forward channel. In this case, BTS carries out the monitor of the receive buffer, and measures an input data rate. Processing of the receive buffer of BTS is slower than an input data rate, and when filled more quickly than the case where a buffer is permissible, according to this invention, BTS notifies the data rate of a backward channel to MS that it is made late. When processing of the receive buffer of BTS is quicker than an input data rate, it notifies to MS that BTS increases a data rate.
[0026] Drawing 3 shows the flow chart of one example of this invention. First, a communication link is established with block 300 between BTS (for example, BTS104 of drawing 1), and MS (for example, MS106 of drawing 1). This communication link can be started, MS which requires access to a network, or when BTS notifies to MS that it is required that a user should go into a network. After a communication link is established, BTS establishes a data transmission stream first using either a low speed DCCH or a basic channel. With block 305, BTS carries out the monitor of the data rate on a forward channel and a backward channel during an active data session. Next, the result of a monitoring facility is sent to the judgment function of block 310. Block 310 compares with a predetermined threshold the parameter value of the forward direction link by which the monitor was carried out. Since the forward direction link is operating in a permissible limitation and there is no need for adjustment about a forward direction link when the monitor value of a forward direction link is within a threshold, actuation progresses to processing of the hard flow link of block 410. When that is not right, in order for a forward direction link not to have to operate in a permissible limitation but to have to adjust a data rate, actuation progresses to block 320.
[0027] Block 320 compares an actual data rate with a channel data rate. When a channel data rate is too late compared with an actual data rate, in order to increase a channel data rate, actuation progresses to block 330. When that is not right, in order to decrease a channel data rate, actuation progresses to block 350.
[0028] With block 330, it checks whether inspection of the current condition of a data link is performed and the link has already operated by maximum capacity. Since it is impossible to

increase the rate on a forward direction link more than this when the link is operating at the maximum rate, actuation progresses to block 410. On the other hand, when increase of the data rate of a channel is possible, actuation progresses to block 340. By block 340, a higher data rate is chosen and assigned by DCCH, the basic channel, or the auxiliary channel. The threshold level corresponding to this high data rate can also be assigned at this time.

[0029] With block 350, it checks whether inspection of the current condition of a data link is performed and the link has already operated by the minimum capacity. Since it is impossible to decrease the rate on a forward direction link more than this when the link is operating at the minimum rate, actuation progresses to block 410. On the other hand, the link is not operating at the minimum rate, and when it is possible to decrease a data rate further, actuation progresses to block 360.

[0030] By block 360, a lower data rate is chosen and assigned by the suitable channel (DCCH, a basic channel, or auxiliary channel). The threshold level corresponding to this low data rate can also be assigned at this time.

[0031] With block 410, this invention operates about a hard flow link the same with having explained the forward direction link. When the data rate of a hard flow link is too late, it is directed to MS that BTS increases a data rate. When the data rate of a hard flow link is too high, it is directed to MS that BTS decreases a data rate.

[0032] If the actuation about a forward direction link and a hard flow link is completed, actuation will progress to block 500 and will repeat the monitoring of a forward direction link and a hard flow link about each active user in a network.

[0033] In the 2nd example of this invention, MS can perform a monitoring facility about the amount of the data which are standing by the transmission to BTS from MS. If the conditions of overflow of the buffer expected or an underflow occur, an information signal will be sent to BTS from MS, and BTS will adjust the data rate in a hard flow link from this signal. the threshold used by the buffer control function of MS in order to determine the time when an underflow / overflow signal should be sent to BTS, in this example -- beforehand -- or giving MS is possible dynamically. This threshold is equivalent to the data rate used like the monitoring facility of a forward direction link.

[0034] Thus, this invention offers the new method of adjusting dynamically the bandwidth/power level assigned to the given data service to the actual data rate of which it is required with the source.

[0035]

[Effect of the Invention] As [conclusion] this invention provides a user with the need and minimum sufficient data rate filling a demand of a user, it offers the new means to which the data rate of a communication channel is fitted dynamically. By assigning such minimum data rate, consumption of the output power for maintaining a communication link with each user is made low, a base station can make low power consumed by per user, and the capacity for adding a user increases.

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PRIOR ART

[Description of the Prior Art] In order to make it possible to transmit an information signal between a dispatch (source) location and a destination (destination) location, the wireless communication mode is developed. In order to transmit such an information signal through the communication channel which links a dispatch location and a destination location, the analog (the 1st generation) and the digital (second generation) method have been used. The digital method is more advantageous than an analog form. For example, the encryption for the high resistance over the noise of a channel or interference, large capacity, and a safe (security is high) communication link is a point with an advantageous digital method compared with an analog form.

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rate) bandwidth segment during the period of an occasional data burst. Since a third generation method can treat high-speed-data transmission of such burst nature, it can improve the throughput and delay to a user, and is advantageous. However, since the momentary bandwidth required of transmission of a high-speed-data burst is large, it must treat carefully so that an unjust interference with service of the others which use management of such a burst and the frequency allocation especially with the same allocation of power and a system resource may be avoided.

[0007] Naturally in the wireless system which can transmit a large data block, the highest data rate will be assigned to a bulk transmission user. If a data rate doubles, since only the one half of time amount until it completes transmission is less necessary, the time amount which transmits a user's data will become min by assigning such a user the highest data rate. However, the need over the resource of a base station also grows as the number of users increases and the information transmitted moves from voice to multimedia (a real-time image and voice). In order to offer service of level permissible to the whole user and to guarantee that there is sufficient capacity, communication system is efficient and must be able to assign a system resource dynamically by the high approach of cost effectiveness. Adjusting the data rate of a user's class in a multiuser signal environment is indicated by U.S. Pat. No. 5,857,147 (artificer: others [Gardner]) so that all permissible signal qualities may be maintained for every class of a user.

[0008] If a new user demands the entry to a wireless network, the base station of communication system must determine a resource required to hold a demand of the user, and must assign a user the resource. When sufficient resource to hold the user is not available, a base station must postpone establishment of connection with a user, and a user has to wait for it until sufficient resource becomes available.

[0009] There are output power and a data rate in the resource which must be assigned in case a base station establishes the communication link to a user. Output power and a data rate are in proportionality. That is, output power required to establish and maintain a link with a user increases while a data rate increases. It is required in order that it may maintain the output energy per bit on fixed level that output power increases in this way with increase of a data rate. Since the output-power resource of a base station is limited, individually, it must collect and a base station must balance an output-power limit of the base station, and a transmission demand of a user.

[Translation done.]

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EFFECT OF THE INVENTION

[Effect of the Invention] As [conclusion] this invention provides a user with the need and minimum sufficient data rate filling a demand of a user, it offers the new means to which the data rate of a communication channel is fitted dynamically. By assigning such minimum data rate, consumption of the output power for maintaining a communication link with each user is made low, a base station can make low power consumed by per user, and the capacity for adding a user increases.

[Translation done.]

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] Therefore, if there is a demand of the entry to the wireless network by the user, a base station must evaluate a user's data rate and a power demand to the present user environment and a power demand. If a user environment approaches total system capacity, as for a base station, the entry of the user to a system is postponed, and it must be made for the output-power capacity of a base station not to have to become an overload. For example, the base station which is processing two or more users who demand a respectively high data rate may be unable to accept the demand of access by the user of an additional low data rate. It is the case where there is only no power which fills a demand of the low data rate user of the addition in the base station. Lack of this power may be based on excessive consumption of the power relevant to inefficient allocation of a data rate to a user rather than was caused by the number of the users in a system. Assigning a user a data rate sharply higher than a thing required to fill the demand of a user's instancy wastes a system resource, and in case the number of the users in whom concurrent access is possible to a system is decreased and is accessed in a network, it increases the delay which a user receives. Therefore, in order to provide a user with the minimum data rate and to offer the reduced power to which that it is only enough to fill a transmission demand of a user corresponds, to manage the resource of a base station efficiently and to use it is needed.

[Translation done.]

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MEANS

[Means for Solving the Problem] The purpose of this invention is assigning the transmission data rate of a wireless system efficiently by determining a transmission demand of a user dynamically during an active data session. Another purpose of this invention is adjusting transmission data dynamically by carrying out the monitor of the transmission data buffer during an active data session. Another purpose of this invention is adjusting dynamically the assigned transmission data rate indispensable filling a demand of a user, and managing it.
[0012] Using the low-speed channel (for example, control or a signaling channel) of a fixed rate, this invention transmits the user data to the data rate of a channel, and further, in order to fill a transmission demand of a user, it operates so that the time of having to use high speed datalink may be determined. In case this function is performed, this invention carries out the monitor of the amount of the data in a transmitting data buffer and a receive data buffer during an active data session. The monitor of each buffer is separately carried out for each [its service is given by the base station] active user of every, respectively. If the amount of the data in transmission or a receive buffer exceeds a predetermined threshold, a high-speed data rate can be set up using an auxiliary data channel, and a base station can manage a data buffer within a regular threshold level. Similarly, when the level of the data in a data buffer is less than a desired threshold level (this shows that it is higher than what has the data rate required for a user currently offered), a low-speed data rate is used. In this way, the minimum data rate required to transmit data between a base station and the user of a remote site is assigned to each user.
[0013]
[Embodiment of the Invention] The core of an early wireless method, especially the 1st generation analog form was mainly voice communication. There was an improvement of various extent about voice quality, network capacity, and advanced service with second generation wireless methods, such as CDMA, TDMA, and GSM. However, although the second generation method is suitable for voice, low rate data, facsimile, and offer of messaging, generally it cannot cope with the demand of a mobile high-speed data rate effectively and efficiently. The progress to a third generation wireless communication link can essentially express the paradigm shift to the world of multimedia mobile communications, and a user can access not only voice service but video, an image, a text, a graphic, and data communication. It is expected that a third generation network provides a mobile user with the data rate of 144Kbps - 2Mbps.
[0014] Nevertheless, in the wireless network which supports such high-speed-data-transmission application, in order to avoid the service refusal by unsuitable allocation of the bandwidth between such applications, and power, bandwidth and power control must be managed very carefully. This invention offers the new method of improving effectiveness of operation and reducing establishment of service refusal by improving management of the power about such high-speed-data application, and bandwidth so that it may explain below. Below, in the case of the desirable example based on CDMA coding of a wireless signal, this invention is explained, but the ** kana of the ability of the approach of this invention to be applied to other wireless channelization configurations, such as TDMA and GSM, is **.
[0015] The typical wireless communication system configuration which contains in drawing 1 the mobile communication exchange center (MSC:Mobile Switch Center) 100, two or more base

station controllers (BSC:Base Station Controller) 102, two or more base transceiver offices (BTS:Base Transceiver Station) 104, and two or more remote users that operate a mobile station (MS:Mobile Station) 106, respectively is shown. In addition to offering management and a control function for the component of a wireless network, MSC100 offers the interface between a wireless network, a cable network (PSTN110), or another wireless network (MSC120). BSC102 offers control and a function manager to one or more BTS(s)104. BTS104 consists of a set of the transceiver in which remote adjustment is usually possible arranged to the wireless site, and is the terminal point of the wireless path by the side of a network. As shown in drawing 1 , generally each BTS104 performs the remote user and radio in a cel on behalf of one cel 108 in a wireless network. Cell sizes may differ in a network according to the user consistency expected in each cel. Although the cel which has activation hippo REJIERIA of hundreds of feet (30-300 meters) order is set up in the field where population density is high, cell size can be enlarged all the time in the field where population density is low. Moreover, this cell size determines the power capacity of BTS104. It is because larger output power than a small cel is needed, so that a cel becomes large.

[0016] A mobile station 106 (for example, a cellular phone machine, a computer terminal, or a facsimile machine) carries out termination of the wireless path from BTS104, and offers access to a network service to the user served. According to a practice, the bidirectional radio link between BTS104 and MS106 is called forward channel, when BTS104 transmits to a mobile station 106, and when MS106 transmits to BTS104, it is called backward channel.

[0017] The CDMA forward-channel multiplexing configuration decided to drawing 2 by the present version of TIA/EIA / 2000.IS-2 criterion is shown. A pilot channel (PCH:Pilot Channel, 201) operates so that an unmodulated signal may be continuously transmitted in a CDMA system. PCH offers the phase criteria for a coherent modulation, and the means of the signal strength comparison between BTS(s). An exclusive control channel (DCCH:Dedicated Control Channel, 202) is used in order to transmit digital control information (power control information is included) to MS from BTS. A basic channel (FCH:Fundamental Channel, 203) transmits the data of a high level, and the combination of power control information. An auxiliary channel (SCH:Supplemental Channel, 204) acts with DCCH or FCH, and the high data rate service (or burst data transfer) which transmits high-level data is offered.

[0018] Therefore, using this channel configuration, although the transmission conditions required of voice and data differ greatly, a forward direction traffic channel can be adapted so that the traffic of both voice and data may be transmitted. Once voice transmission is continuous, duration is comparatively long and transmission starts, it will be required that there is no interruption of transmission. If transmission is interrupted, received data are nonpermissible in a receiving side. as for such reception, data are inputted into a receiver -- ** -- it is alike, is processed and evaluates -- having (namely, real-time operation) -- it fragments and is because it comes apart.

[0019] Highly precise voice transmission can be attained by changing voice fluctuation into a digital format and transmitting the digitized voice pattern at 64 kilobits/s (64Kbps). It turns out that digitization at a rate higher than 64Kbps(es) does not improve the voice pattern reproduced further. Therefore, generally an audio transmission rate does not exceed 64Kbps(es). Generally, permissible audio performance and quality are acquired by transmission to the order of 8Kbps.

[0020] On the other hand, generally, data traffic can appear as a train of a pulse, can divide this into a packet, can be transmitted, and can collect and reformat a packet with a receiver. It is in random order, and may be received, and generally a packet is in random order, and is received. A receiver requires resending of a packet with an error, or the discarded packet, and an error and packet loss are compensated. Therefore, data traffic does not impose the need for transmission without interruption to a system. Furthermore, data traffic differs from voice transmission in that it communicates with a sharply different data rate according to the demand of the source and transmission. For example, a facsimile transmission, an electronic mail, and text data can use a low-speed data rate (order of 9.6Kbps) comparatively. It is because a related data quality can generally be transmitted by appropriate time amount also with such a low data rate. However, in order to shorten transmission of the graphics and video like an image on the level which can

permit time amount required to transmit a lot of digital data contained in graphics or a video image, a very high data rate is required.
[0021] In consideration of various data transmission demands of a user, the approach of this invention assigns a minimum data rate and minimum corresponding output power, in order to fill a transmission demand of a user. According to this invention, first, if the link between MS106 and BTS104 is established, BTS104 will initialize the parametric data of a forward channel and a backward channel using a low-speed control channel. The forward direction and a backward channel are assigned to each active user in a system. It is uniquely identified by the sign to which any channel is assigned in a CDMA wireless system. The exclusive control channel (DCCH, drawing 2) of a forward channel is used as a control channel. However, this channel can also be used for transmitting low-speed information data.
[0022] According to the approach of this invention, BTS104 initializes a user's and an active data session using DCCH. This DCCH will transmit both control data and information data. In another example of this invention, BTS assigns a low-speed basic channel for an information data bit, and, on the other hand, DCCH is used for a control function.
[0023] While information data are transmitted between BTS and MS, BTS carries out the monitor of the data transmission buffer and data receive buffer which were assigned to each user. By measuring the amount of the data in each buffer, BTS measures the input data rate which supplies information to a transmission buffer and a receive buffer, and confirms that the amount of data remains in a limitation permissible by both transmission (forward channel) of information data, and reception (backward channel). Rather than the rate at which the user supplies data to BTS, when a transmission data rate is late, the amount of data in a buffer will increase across a permissible limitation. If this condition is not amended correctly, the amount of data will exceed buffer size (overflow), and data will be lost.
[0024] If it judges that the approach of this invention has a too quick input data rate, the possibility of an overflow condition is expected and it directs to change a communication link into a high-speed data rate more to BTS. This high-speed data rate can be carried out to one of the rate of the higher one on DCCH or a basic channel, or rates with an available auxiliary channel. The auxiliary channel (drawing 2) of a forward channel can transmit information data at the rate exceeding 1Mbps. Similarly, rather than the rate at which the user supplies data to BTS, when a transmission data rate is quick, the amount of data in a buffer will be less than a permissible limitation, and will decrease. Finally a buffer not only becomes empty (underflow), but on this condition, BTS will consume the superfluous output power for holding that high data rate with a high data rate. Like the response at the time of a data rate being too late when this underflow is expected, this invention directs to use the data rate of the lower (as long as it justifies) one on DCCH, a basic channel, or an auxiliary channel to BTS so that it may correspond to an actual transmission demand of a user.
[0025] By the backward channel, the monitor of the superfluous data rate conditions inadequate in ** again is carried out like actuation of this invention on a forward channel. In this case, BTS carries out the monitor of the receive buffer, and measures an input data rate. Processing of the receive buffer of BTS is slower than an input data rate, and when filled more quickly than the case where a buffer is permissible, according to this invention, BTS notifies the data rate of a backward channel to MS that it is made late. When processing of the receive buffer of BTS is quicker than an input data rate, it notifies to MS that BTS increases a data rate.
[0026] Drawing 3 shows the flow chart of one example of this invention. First, a communication link is established with block 300 between BTS (for example, BTS104 of drawing 1), and MS (for example, MS106 of drawing 1). This communication link can be started, MS which requires access to a network, or when BTS notifies to MS that it is required that a user should go into a network. After a communication link is established, BTS establishes a data transmission stream first using either a low speed DCCH or a basic channel. With block 305, BTS carries out the monitor of the data rate on a forward channel and a backward channel during an active data session. Next, the result of a monitoring facility is sent to the judgment function of block 310. Block 310 compares with a predetermined threshold the parameter value of the forward direction link by which the monitor was carried out. Since the forward direction link is operating in a

permissible limitation and there is no need for adjustment about a forward direction link when the monitor value of a forward direction link is within a threshold, actuation progresses to processing of the hard flow link of block 410. When that is not right, in order for a forward direction link not to have to operate in a permissible limitation but to have to adjust a data rate, actuation progresses to block 320.

[0027] Block 320 compares an actual data rate with a channel data rate. When a channel data rate is too late compared with an actual data rate, in order to increase a channel data rate, actuation progresses to block 330. When that is not right, in order to decrease a channel data rate, actuation progresses to block 350.

[0028] With block 330, it checks whether inspection of the current condition of a data link is performed and the link has already operated by maximum capacity. Since it is impossible to increase the rate on a forward direction link more than this when the link is operating at the maximum rate, actuation progresses to block 410. On the other hand, when increase of the data rate of a channel is possible, actuation progresses to block 340. By block 340, a higher data rate is chosen and assigned by DCCH, the basic channel, or the auxiliary channel. The threshold level corresponding to this high data rate can also be assigned at this time.

[0029] With block 350, it checks whether inspection of the current condition of a data link is performed and the link has already operated by the minimum capacity. Since it is impossible to decrease the rate on a forward direction link more than this when the link is operating at the minimum rate, actuation progresses to block 410. On the other hand, the link is not operating at the minimum rate, and when it is possible to decrease a data rate further, actuation progresses to block 360.

[0030] By block 360, a lower data rate is chosen and assigned by the suitable channel (DCCH, a basic channel, or auxiliary channel). The threshold level corresponding to this low data rate can also be assigned at this time.

[0031] With block 410, this invention operates about a hard flow link the same with having explained the forward direction link. When the data rate of a hard flow link is too late, it is directed to MS that BTS increases a data rate. When the data rate of a hard flow link is too high, it is directed to MS that BTS decreases a data rate.

[0032] If the actuation about a forward direction link and a hard flow link is completed, actuation will progress to block 500 and will repeat the monitoring of a forward direction link and a hard flow link about each active user in a network.

[0033] In the 2nd example of this invention, MS can perform a monitoring facility about the amount of the data which are standing by the transmission to BTS from MS. If the conditions of overflow of the buffer expected or an underflow occur, an information signal will be sent to BTS from MS, and BTS will adjust the data rate in a hard flow link from this signal. the threshold used by the buffer control function of MS in order to determine the time when an underflow / overflow signal should be sent to BTS, in this example -- beforehand -- or giving MS is possible dynamically. This threshold is equivalent to the data rate used like the monitoring facility of a forward direction link.

[0034] Thus, this invention offers the new method of adjusting dynamically the bandwidth/power level assigned to the given data service to the actual data rate of which it is required with the source.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is drawing showing the typical structure of wireless communication system where the approach of this invention is used.
[Drawing 2] It is drawing showing a format of the forward channel in the wireless system by which this invention is used.
[Drawing 3] It is a flow chart showing the example of this invention.
[Description of Notations]
100 Mobile Communication Exchange Center (MSC)
102 Base Station Controller (BSC)
104 Base Transceiver Station (BTS)
106 Mobile Station (MS)
108 Cel
110 PSTN
120 MSC
201 Pilot Channel (PCH)
202 Exclusive Control Channel (DCCH)
203 Basic Channel (FCH)
204 Auxiliary Channel (SCH)

[Translation done.]

* NOTICES *

CORRECTION OR AMENDMENT

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[Document to be Amended] Specification
[Item(s) to be Amended] Claim
[Method of Amendment] Modification
[Proposed Amendment]
[Claim(s)]
[Claim 1] In the wireless communication system which has a base station and at least one mobile station,
Said base station operates so that a communication link with at least one mobile station may be established, and this communication link has two or more channel and two or more data rate modes,
a. The step which measures the data rate of transmission on the communication link to the given user based on the measured value of the data in a data buffer,
b. How to choose [from] the data rate mode in the communication link to the given user characterized by having the step which chooses sufficient data rate to support the data rate of the measured communication link among said two or more data rate modes to said given user.
[Claim 2] Said steps a and b are approaches according to claim 1 characterized by being repeated about said given user so that said at least one channel and data rate chosen may be adjusted dynamically based on change of the measured value of said data buffer.

[Claim 3] Said steps a and b are approaches according to claim 1 characterized by being repeated over almost all the mobile stations in said system.
[Claim 4] It is the approach according to claim 1 which, as for this forward direction link, said communication link has a control channel and a traffic channel including a forward direction link, and is characterized by this control channel operating so that control command and traffic data may be transmitted.
[Claim 5] Said forward direction link is an approach according to claim 4 characterized by being chosen so that it may have sufficient capacity to support the data rate chosen.
[Claim 6] It is the approach according to claim 1 which, as for this hard flow link, said communication link has a control channel and a traffic channel including a hard flow link, and is characterized by this control channel operating so that control command and traffic data may be transmitted.
[Claim 7] Said hard flow link is an approach according to claim 6 characterized by being chosen so that it may have sufficient capacity to support the data rate chosen.
[Claim 8] Said data buffer is an approach according to claim 1 characterized by including the input data buffer which receives data through said communication link.
[Claim 9] The measured value of the data in said input data buffer is an approach according to claim 8 characterized by what it opts for to a known threshold limitation.
[Claim 10] Said threshold limitation is an approach according to claim 9 characterized by including two or more predetermined thresholds corresponding to said two or more data rate modes.
[Claim 11] Said data buffer is an approach according to claim 1 characterized by including the output data buffer which receives data through said communication link.
[Claim 12] The measured value of the data in said output data buffer is an approach according to claim 11 characterized by what it opts for to a known threshold limitation.
[Claim 13] Said threshold limitation is an approach according to claim 12 characterized by including two or more predetermined thresholds corresponding to said two or more data rate modes.
[Claim 14] Said communication link is an approach according to claim 1 characterized by being established by the CDMA method.
[Claim 15] In the approach of assigning channel capacity accommodative with the wireless communication system which has at least one base station and at least one mobile station which communicates with this base station through a communication link,
a. The step which starts a data communication stream by the low-speed channel of said communication link between said at least one base station and one mobile station,
b. The step which measures the data rate received by the data buffer from the source of said data communication stream,
c. The step which chooses [from] sufficient data rate to support the measured data rate among two or more data rates,
d. How to assign channel capacity accommodative with the wireless communication system characterized by having the step which assigns the selected data rate to said data communication stream.

[Translation done.]

引用文献 2

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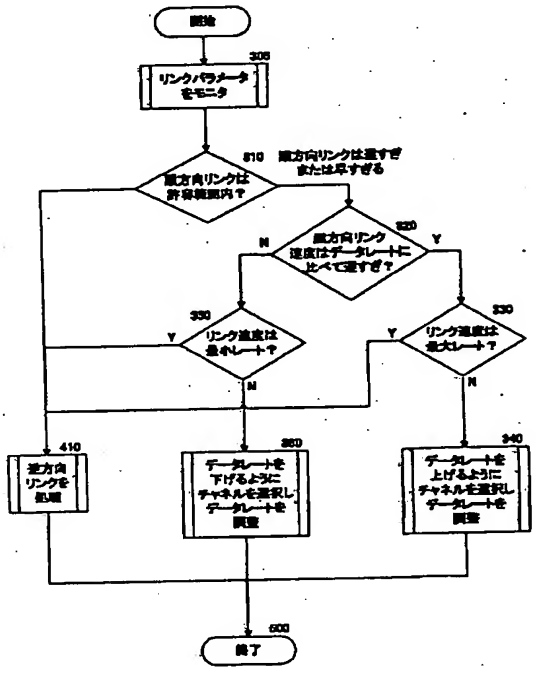
最終頁に続く

(54)【発明の名称】　通信リンクにおけるデータレートモードを選択する方法

(57)【要約】
【課題】　アクティブなデータセッション中にユーザの伝送要求を動的に決定することにより、ワイヤレスシステムの伝送データレートを効率的に割り当てる。
【解決手段】　アクティブデータセッション中に送信データバッファおよび受信データバッファ内のデータの量をモニタする。各バッファはそれぞれ別個に、および、基地局によってサービスされる各アクティブユーザごとに別個に、モニタされる。送信または受信バッファ内のデータの量が所定のしきい値を超えると、補助データチャネルを用いて高速データレートが設定され、基地局は、規定のしきい値レベル内でデータバッファを管理することができるようになる。同様に、データバッファ内のデータのレベルが所望のしきい値レベルを下回った場合、低速データレートが使用される。こうして、各ユーザには、基地局と、移動局との間でデータを伝送するのに必要な最小限のデータレートが割り当てられる。



【特許請求の範囲】

【請求項１】　基地局および少なくとも１つの移動局を有するワイヤレス通信システムにおいて、

前記基地局は、少なくとも１つの移動局との通信リンクを確立するように動作し、該通信リンクは複数のチャネルおよび複数のデータレートモードを有し、

ａ．データバッファ内のデータの測定値に基づいて、与えられたユーザに対する通信リンク上の伝送のデータレートを測定するステップと、

ｂ．前記与えられたユーザに対して、前記複数のデータレートモードのうちから、測定された通信リンクのデータレートをサポートするのに十分なデータレートを選択するステップとを有することを特徴とする、与えられたユーザに対する通信リンクにおけるデータレートモードを選択する方法。

【請求項２】　前記ステップａおよびｂは、前記データバッファの測定値の変化に基づいて、前記少なくとも１つのチャネルおよび選択されるデータレートを動的に調整するように、前記与えられたユーザについて反復されることを特徴とする請求項１に記載の方法。

【請求項３】　前記ステップａおよびｂは、前記システム内のほぼすべての移動局にわたり反復されることを特徴とする請求項１に記載の方法。

【請求項４】　前記通信リンクは順方向リンクを含み、該順方向リンクは制御チャネルおよびトラフィックチャネルを有し、該制御チャネルは、制御コマンドおよびトラフィックデータを伝送するように動作することを特徴とする請求項１に記載の方法。

【請求項５】　前記順方向リンクは、選択されるデータレートをサポートするのに十分な容量を有するように選択されることを特徴とする請求項４に記載の方法。

【請求項６】　前記通信リンクは逆方向リンクを含み、該逆方向リンクは制御チャネルおよびトラフィックチャネルを有し、該制御チャネルは、制御コマンドおよびトラフィックデータを伝送するように動作することを特徴とする請求項１に記載の方法。

【請求項７】　前記逆方向リンクは、選択されるデータレートをサポートするのに十分な容量を有するように選択されることを特徴とする請求項６に記載の方法。

【請求項８】　前記データバッファは、前記通信リンクを通じてデータを受信する入力データバッファを含むことを特徴とする請求項１に記載の方法。

【請求項９】　前記入力データバッファ内のデータの測定値は、既知のしきい値限界に対して決定されることを特徴とする請求項８に記載の方法。

【請求項１０】　前記しきい値限界は、前記複数のデータレートモードに対応する複数の所定のしきい値を含むことを特徴とする請求項９に記載の方法。

【請求項１１】　前記データバッファは、前記通信リンクを通じてデータを受信する出力データバッファを含むことを特徴とする請求項１に記載の方法。

【請求項１２】　前記出力データバッファ内のデータの測定値は、既知のしきい値限界に対して決定されることを特徴とする請求項１１に記載の方法。

【請求項１３】　前記しきい値限界は、前記複数のデータレートモードに対応する複数の所定のしきい値を含むことを特徴とする請求項１２に記載の方法。

【請求項１４】　前記通信リンクは、ＣＤＭＡ方式で確立されることを特徴とする請求項１に記載の方法。

【請求項１５】　少なくとも１つの基地局と、通信リンクを通じて該基地局と通信する少なくとも１つの移動局とを有するワイヤレス通信システムでチャネル容量を適応的に割り当てる方法において、

ａ．前記少なくとも１つの基地局と１つの移動局との間で前記通信リンクの低速チャネルでデータ通信ストリームを開始するステップと、

ｂ．前記データ通信ストリームのソースからデータバッファで受信されるデータレートを測定するステップと、

ｃ．複数のデータレートのうちから、測定されたデータレートをサポートするのに十分なデータレートを選択するステップと、

ｄ．選択されたデータレートを前記データ通信ストリームに割り当てるステップとを有することを特徴とする、ワイヤレス通信システムでチャネル容量を適応的に割り当てる方法。

【請求項１６】　前記ステップａ～ｄは、前記１つの移動局について反復されることにより、前記選択されたデータレートは、前記データバッファの測定値の変化に基づいて動的に調整されることを特徴とする請求項１５に記載の方法。

【請求項１７】　前記ステップａ～ｄは、前記システム内のほぼすべての移動局にわたり反復されることを特徴とする請求項１５に記載の方法。

【請求項１８】　前記通信リンクは順方向リンクを含み、該順方向リンクは制御チャネルおよびトラフィックチャネルを有し、該制御チャネルは、前記低速チャネルとして配置され、制御コマンドおよびトラフィックデータを伝送するように動作することを特徴とする請求項１５に記載の方法。

【請求項１９】　前記順方向リンクは、前記選択されたデータレートをサポートするのに十分な容量を有するように選択されることを特徴とする請求項１８に記載の方法。

【請求項２０】　前記通信リンクは逆方向リンクを含み、該逆方向リンクは制御チャネルおよびトラフィックチャネルを有し、該制御チャネルは、前記低速チャネルとして配置され、制御コマンドおよびトラフィックデータを伝送するように動作することを特徴とする請求項１５に記載の方法。

【請求項２１】　前記逆方向リンクは、前記選択された

データレートをサポートするのに十分な容量を有するように選択されることを特徴とする請求項２０に記載の方法。

【請求項２２】　前記データバッファは、前記通信リンクを通じてデータを受信する入力データバッファを含むことを特徴とする請求項１５に記載の方法。

【請求項２３】　前記入力データバッファ内のデータの測定値は、既知のしきい値限界に対して決定されることを特徴とする請求項２２に記載の方法。

【請求項２４】　前記しきい値限界は、前記複数のデータレートモードに対応する複数の所定のしきい値を含むことを特徴とする請求項２３に記載の方法。

【請求項２５】　前記データバッファは、前記通信リンクを通じてデータを受信する出力データバッファを含むことを特徴とする請求項１５に記載の方法。

【請求項２６】　前記出力データバッファ内のデータの測定値は、既知のしきい値限界に対して決定されることを特徴とする請求項２５に記載の方法。

【請求項２７】　前記しきい値限界は、前記複数のデータレートモードに対応する複数の所定のしきい値を含むことを特徴とする請求項２６に記載の方法。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、ワイヤレス通信方式に関し、特に、このようなシステムにおいてデータサービスに対する信号データレートをモニタし動的に割り当てることに関する。

【０００２】

【従来の技術】発信（ソース）ロケーションと宛先（デスティネーション）ロケーションの間で情報信号を伝送することを可能にするためにワイヤレス通信方式が開発されている。発信ロケーションと宛先ロケーションをリンクする通信チャネルを通じてこのような情報信号を伝送するために、アナログ（第１世代）およびディジタル（第２世代）方式が使用されてきている。ディジタル方式は、アナログ方式より有利になっている。例えば、チャネルのノイズや干渉に対する高い耐性、大容量、安全な（セキュリティの高い）通信のための暗号化は、アナログ方式に比べてディジタル方式が有利な点である。

【０００３】第１世代の方式は主に音声通信を目的としていたが、第２世代の方式は、音声およびデータの両方の応用をサポートする。第２世代方式において、さまざまな伝送要求条件を有するデータ伝送を扱うためのいくつかの技術が知られている。特に、パケットデータ伝送では伝送期間が一般に比較的短いのに対して、音声伝送は期間が長く、通信チャネルへの連続的なアクセスを必要とする。ワイヤレスネットワークにアクセス可能なユーザの数を増大させるために、いくつかの変調／符号化方式が開発されており、例えば、周波数分割多元接続（ＦＤＭＡ）、時分割多元接続（ＴＤＭＡ）および符号分割多元接続（ＣＤＭＡ）がある。ＣＤＭＡ方式は、ＦＤＭＡ方式やＴＤＭＡ方式よりもマルチパス歪みや共通チャネル干渉に対する耐性があり、ＦＤＭＡ方式やＴＤＭＡ方式に共通の周波数／チャネル計画の負担が軽減される。

【０００４】ＣＤＭＡ方式では、ユーザを一意的に識別し、ユーザの信号を広い帯域幅にわたって拡散するために、固有のバイナリ符号系列が、セル内のアクティブな各ユーザに割り当てられる。ユーザの信号は、割り当てられた符号が乗じられ、ユーザの信号帯域幅よりも広いチャネル帯域幅全体に拡散される。システムチャネル帯域幅の、ユーザ帯域幅に対する比を、システムの「拡散利得」という。与えられた信号対干渉（Ｓ／Ｉ）レベルに対して、ＣＤＭＡシステムの容量は、「拡散利得」に比例する。送信された信号を受信した後、各ユーザの信号は、所望の信号の符号系列でキーイングされる相関器を用いることによって、他のユーザの信号から分離（逆拡散）される。

【０００５】第１世代のアナログ方式および第２世代のディジタル方式は、限定されたデータ通信能力とともに音声通信をサポートするように設計された。第３世代のワイヤレス方式は、ＣＤＭＡのような広帯域多元接続技術を用いて、音声、ビデオ、データおよび画像のようなさまざまなサービスを効果的に扱うことが期待される。第３世代方式によってサポートされる機能のうちには、移動端末と陸上通信線ネットワークの間での高速データ伝送がある。知られているように、高速データ通信は、しばしば、高いデータ伝送レートでの短い伝送「バースト」と、それに続いて、データソースからの伝送アクティビティがほとんどまたは全くない、やや長い期間とによって特徴づけられる。

【０００６】第３世代方式においてこのような高速データサービスのバースト性に対処するために、通信システムは、ときどきのデータバーストの期間中に（高いデータレートに対応する）大きい帯域幅セグメントを割り当てる必要がある。第３世代方式はこのようなバースト性の高速データ伝送を扱うことができるため、ユーザに対するスループットおよび遅延を改善することができて有利である。しかし、高速データバーストの伝送に要求される瞬間的な帯域幅が大きいため、このようなバーストの管理、特に、パワーおよびシステムリソースの割当ては、同じ周波数割当てを使用する他のサービスとの不当な干渉を避けるように、注意して扱わなければならない。

【０００７】大きいデータブロックの伝送が可能なワイヤレスシステムでは、最高データレートが当然バルク伝送ユーザに割り当てられることになる。データレートが２倍になれば、伝送を完了するまでの時間は半分しか必要でなくなるため、最高データレートをこのようなユーザに割り当てることにより、ユーザのデータを伝送する

時間が最小になる。しかし、ユーザの数が増大し、伝送される情報が音声からマルチメディア（リアルタイム映像と音声）へと移るにつれて、基地局のリソースに対する需要も増大する。ユーザ全体に許容可能なレベルのサービスを提供するために十分な容量があることを保証するには、通信システムは、効率的で費用効果の高い方法でシステムリソースを動的に割り当てることができなければならない。米国特許第５，８５７，１４７号（発明者：Gardner他）には、許容可能な全信号品質がユーザのクラスごとに維持されるように、マルチユーザ信号環境においてユーザのクラスのデータレートを調整することが記載されている。

【０００８】新たなユーザがワイヤレスネットワークへのエントリを要求すると、通信システムの基地局は、そのユーザの要求を収容するのに必要なリソースを決定し、そのリソースをユーザに割り当てなければならない。そのユーザを収容するのに十分なリソースが利用可能でない場合、基地局は、ユーザとの接続の確立を延期しなければならず、ユーザは、十分なリソースが利用可能になるまで待たなければならない。

【０００９】基地局がユーザへの通信リンクを確立する際に割り当てなければならないリソースには、出力パワーおよびデータレートがある。出力パワーとデータレートは比例関係にある。すなわち、ユーザとのリンクを確立し維持するのに必要な出力パワーは、データレートが増大するとともに増大する。データレートの増大とともにこのように出力パワーが増大することは、ビットあたりの出力エネルギーを一定レベルに維持するために要求される。基地局の出力パワーリソースは限定されているため、基地局は、その基地局の出力パワー制限と、ユーザの伝送要求とのバランスを、個別にまたはまとめて、とらなければならない。

【００１０】

【発明が解決しようとする課題】従って、ユーザによるワイヤレスネットワークへのエントリの要求があると、基地局は、ユーザのデータレートおよびパワー要求を、現在のユーザ環境およびパワー要求に対して評価しなければならない。ユーザ環境が全システム容量に近づくと、基地局は、システムへのユーザのエントリを延期して、基地局の出力パワー能力が過負荷にならないようにしなければならない。例えば、それぞれ高いデータレートを要求する複数のユーザを処理している基地局は、追加の低いデータレートのユーザによるアクセスの要求を受け入れることができない可能性がある。それは、その基地局にはその追加の低データレートユーザの要求を満たすだけのパワーがない場合である。このパワーの欠如は、システム内のユーザの数によって引き起こされたのではなく、ユーザへのデータレートの非効率的な割当てに関連するパワーの過大な消費によるものである可能性がある。ユーザの即時の要求を満たすのに必要なものよりも大幅に高いデータレートをユーザに割り当てることは、システムリソースを浪費し、システムに同時アクセス可能なユーザの数を減少させ、ネットワークにアクセスする際にユーザが受ける遅延を増大させる。従って、ユーザに最小限のデータレートを提供し、ユーザの伝送要求を満たすのに十分なだけの対応する低減されたパワーを提供するために、基地局のリソースを効率的に管理し利用することが必要とされている。

【００１１】

【課題を解決するための手段】本発明の目的は、アクティブなデータセッション中にユーザの伝送要求を動的に決定することにより、ワイヤレスシステムの伝送データレートを効率的に割り当てることである。本発明のもう１つの目的は、アクティブデータセッション中に伝送データバッファをモニタすることにより、伝送データを動的に調整することである。本発明のもう１つの目的は、ユーザの要求を満たすのに最低限必要な、割り当てられた伝送データレートを動的に調整し管理することである。

【００１２】本発明は、固定レートの低速チャネル（例えば、制御あるいはシグナリングチャネル）を用いて、チャネルのデータレートまでのユーザデータを伝送し、さらに、ユーザの伝送要求を満たすために高速データリンクを使用しなければならないときを決定するように動作する。この機能を実行する際に、本発明は、アクティブデータセッション中に送信データバッファおよび受信データバッファ内のデータの量をモニタする。各バッファはそれぞれ別個に、および、基地局によってサービスされる各アクティブユーザごとに別個に、モニタされる。送信または受信バッファ内のデータの量が所定のしきい値を超えると、補助データチャネルを用いて高速データレートが設定され、基地局は、規定のしきい値レベル内でデータバッファを管理することができるようになる。同様に、データバッファ内のデータのレベルが所望のしきい値レベルを下回った場合（これは、提供されているデータレートがユーザに必要なものより高いことを示す）、低速データレートが使用される。こうして、各ユーザには、基地局と、リモートサイトのユーザとの間でデータを伝送するのに必要な最小限のデータレートが割り当てられる。

【００１３】

【発明の実施の形態】初期のワイヤレス方式、特に、第１世代アナログ方式の中心は、主に音声通信であった。ＣＤＭＡ、ＴＤＭＡおよびＧＳＭなどの第２世代ワイヤレス方式とともに、音声品質、ネットワーク容量および高度なサービスに関して、さまざまな程度の改善があった。しかし、第２世代方式は音声、低レートデータ、ファックスおよびメッセージングの提供には適しているが、一般に移動体高速データレートの要求に有効にかつ効率的に対処することはできない。第３世代ワイヤレス

通信への進展は、本質的に、マルチメディア移動体通信の世界へのパラダイムシフトを表し、ユーザは、音声サービスだけではなく、ビデオ、画像、テキスト、グラフィックおよびデータ通信にアクセスすることができる。第３世代ネットワークは、１４４Ｋｂｐｓ～２Ｍｂｐｓのデータレートを移動体ユーザに提供すると期待される。

【００１４】それにもかかわらず、このような高速データ通信アプリケーションをサポートするワイヤレスネットワークでは、そのようなアプリケーションどうしの間での帯域幅およびパワーの不適切な割当てによるサービス拒否を避けるために、帯域幅およびパワー制御は非常に注意深く管理しなければならない。以下で説明するように、本発明は、このような高速データアプリケーションに関するパワーおよび帯域幅の管理を改善することにより、動作効率を改善しサービス拒否の確立を低減させる新規な方法を提供する。以下では、本発明について、ワイヤレス信号のＣＤＭＡ符号化に基づく好ましい実施例の場合で説明するが、本発明の方法は、ＴＤＭＡやＧＳＭなどの他のワイヤレスチャネル化構成にも適用可能であることは明らかなはずである。

【００１５】図１に、移動通信交換機センタ（ＭＳＣ：Mobile Switch Center）１００、複数の基地局コントローラ（ＢＳＣ：Base Station Controller）１０２、複数の基地トランシーバ局（ＢＴＳ：Base Transceiver Station）１０４、および、それぞれ移動局（ＭＳ：Mobile Station）１０６を操作する複数のリモートユーザを含む代表的なワイヤレス通信システム構成を示す。ワイヤレスネットワークの構成要素のために管理および制御機能を提供することに加えて、ＭＳＣ１００は、ワイヤレスネットワークと有線ネットワーク（ＰＳＴＮ１１０）または別のワイヤレスネットワーク（ＭＳＣ１２０）との間のインタフェースを提供する。ＢＳＣ１０２は、１つ以上のＢＴＳ１０４に対して制御および管理機能を提供する。ＢＴＳ１０４は、ワイヤレスサイトに配置された、通常は遠隔調整可能なトランシーバのセットからなり、ネットワーク側の無線経路の終端点である。図１に示すように、各ＢＴＳ１０４は一般に、ワイヤレスネットワークにおける１つのセル１０８を代表し、セル内のリモートユーザと無線通信を行う。セルサイズは、各セルで期待されるユーザ密度に応じてネットワーク内で異なり得る。人口密度の高い領域では、数百フィート（３０～３００メートル）のオーダーの実行カバレジエリアを有するセルが設定されるが、人口密度の低い領域では、セルサイズはずっと大きくすることが可能である。また、このセルサイズは、ＢＴＳ１０４のパワー能力を決定する。セルが大きくなるほど、小さいセルよりも大きい出力パワーを必要とするからである。

【００１６】移動局１０６（例えば、セルラ電話機、コンピュータ端末あるいはファクシミリ機）は、ＢＴＳ１０４からの無線経路を終端し、サービスされるユーザに対してネットワークサービスへのアクセスを提供する。ＢＴＳ１０４とＭＳ１０６の間の双方向無線リンクは、慣例により、ＢＴＳ１０４が移動局１０６へ送信するときは順方向チャネルといい、ＭＳ１０６がＢＴＳ１０４へ送信するときは逆方向チャネルという。

【００１７】図２に、ＴＩＡ／ＥＩＡ／ＩＳ－２０００．２標準の現在のバージョンによって確定しているＣＤＭＡ順方向チャネル多重化構成を示す。パイロットチャネル（ＰＣＨ：Pilot Channel、２０１）は、ＣＤＭＡシステムにおいて非変調信号を連続的に送信するように動作する。ＰＣＨは、コヒーレント変調のための位相基準と、ＢＴＳ間の信号強度比較の手段を提供する。専用制御チャネル（ＤＣＣＨ：Dedicated Control Channel、２０２）は、ＢＴＳからＭＳへディジタル制御情報（パワー制御情報を含む）を送信するために使用される。基本チャネル（ＦＣＨ：Fundamental Channel、２０３）は、高レベルのデータおよびパワー制御情報の組合せを伝送する。補助チャネル（ＳＣＨ：Supplemental Channel、２０４）は、ＤＣＣＨあるいはＦＣＨとともに作用して、高レベルデータを伝送する高データレートサービス（あるいはバーストデータ転送）を提供する。

【００１８】従って、音声およびデータに要求される伝送条件は大きく異なるにもかかわらず、順方向トラフィックチャネルは、このチャネル構成を用いて、音声およびデータの両方のトラフィックを伝送するように適応可能である。音声伝送は、連続的で、継続時間が比較的長く、いったん伝送が始まると伝送の中断がないことが要求される。伝送が中断すると、受信データは、受信側には許容できないものとなる。そのような受信は、データが受信機に入力されるごとに処理され評価される（すなわち、リアルタイム処理）が、断片化してばらばらになるからである。

【００１９】高精度の音声伝送は、音声変動をディジタル形式に変換し、ディジタル化された音声パターンを毎秒６４キロビット（６４Ｋｂｐｓ）で伝送することによって達成することができる。６４Ｋｂｐｓより高いレートでのディジタル化は、再現される音声パターンをさらに改善することはないことがわかっている。従って、音声の伝送レートは一般に６４Ｋｂｐｓを超えることはない。一般に、８Ｋｂｐｓのオーダーでの伝送で、許容可能な音声のパフォーマンスおよび品質が得られる。

【００２０】これに対して、データトラフィックは一般に、バルスの列として現れ、これをバケットに分割して送信し、受信機でバケットを収集し再フォーマットすることができる。バケットは、順不同で受信される可能性があり、また一般に順不同で受信される。誤りやバケット損失は、誤りのあるバケットや廃棄されたバケットの再送を受信機が要求して補償される。従って、データトラフィックは、システムに対して、中断のない伝送の必

要性を課さない。さらに、データトラフィックは、ソースおよび伝送の要求に応じて大幅に異なるデータレートで通信されるという点で、音声伝送とは異なる。例えば、ファクシミリ伝送、電子メール、およびテキストデータは、比較的低速のデータレート（９．６Ｋｂｐｓのオーダー）を使用することが可能である。関連するデータの品質は一般にそのような低データレートでも妥当な時間で伝送可能であるからである。しかし、画像のようなグラフィクスやビデオの伝送は、グラフィクスやビデオ画像内に含まれる大量のディジタルデータを伝送するのに必要な時間を許容可能なレベルに短縮するために、非常に高いデータレートを要求する。

【００２１】本発明の方法は、ユーザのさまざまなデータ伝送要求を考慮し、ユーザの伝送要求を満たすために最低限のデータレート、および対応する最低限の出力パワーを割り当てる。本発明によれば、まず、ＭＳ１０６とＢＴＳ１０４の間のリンクが確立されると、ＢＴＳ１０４は、低速制御チャネルを用いて、順方向チャネルおよび逆方向チャネルのパラメトリックデータを初期化する。システム内の各アクティブユーザに、順方向および逆方向チャネルが割り当てられる。いずれのチャネルも、ＣＤＭＡワイヤレスシステムにおいて割り当てられる符号によって一意的に識別される。順方向チャネルの専用制御チャネル（ＤＣＣＨ、図２）が、制御チャネルとして使用される。しかし、このチャネルは、低速の情報データを伝送するのに使用することも可能である。

【００２２】本発明の方法によれば、ＢＴＳ１０４は、ＤＣＣＨを用いて、ユーザのとアクティブデータセッションを初期化する。このＤＣＣＨは、制御データおよび情報データの両方を伝送することになる。本発明のもう１つの実施例では、ＢＴＳは、情報データビットのために低速の基本チャネルを割り当て、一方、ＤＣＣＨは制御機能のために使用される。

【００２３】情報データがＢＴＳとＭＳの間で転送されている間に、ＢＴＳは、個々のユーザに割り当てられたデータ送信バッファおよびデータ受信バッファをモニタする。ＢＴＳは、各バッファ内のデータの量を測定することによって送信バッファおよび受信バッファに情報を供給する入力データレートを測定し、情報データの送信（順方向チャネル）および受信（逆方向チャネル）の両方で許容可能な限界内にデータ量がとどまっていることをチェックする。ユーザがＢＴＳにデータを供給しているレートよりも、伝送データレートが遅い場合、バッファ内のデータ量は、許容可能な限界を超えて増大することになる。この条件を正しく補正しなければ、データ量はバッファサイズを超え（オーバーフロー）、データが失われることになる。

【００２４】本発明の方法は、入力データレートが速すぎると判断すると、オーバーフロー条件の可能性を予想し、通信リンクをより高速データレートに変えるようにＢＴＳに指示する。この高速データレートは、ＤＣＣＨや基本チャネル上の高いほうのレート、または、補助チャネルの利用可能なレートのうちの１つとすることが可能である。順方向チャネルの補助チャネル（図２）は、１Ｍｂｐｓを超えるレートで情報データを伝送することが可能である。同様に、ユーザがＢＴＳにデータを供給しているレートよりも、伝送データレートが速い場合、バッファ内のデータ量は、許容可能な限界を下回って減少することになる。この条件では、バッファが最終的に空になる（アンダーフロー）のみならず、高いデータレートにより、ＢＴＳは、その高いデータレートを収容するための過剰な出力パワーを消費することになる。本発明は、このアンダーフローを予想すると、データレートが遅すぎるときの応答と同様にして、ユーザの実際の伝送要求に対応するように、ＤＣＣＨ、基本チャネルまたは補助チャネル上の（正当化される限り）低いほうのデータレートを使用するようにＢＴＳに指示する。

【００２５】順方向チャネル上の本発明の動作と同様に、逆方向チャネルでは、過剰なまたは不十分なデータレート条件がモニタされる。この場合、ＢＴＳは、受信バッファをモニタし、入力データレートを測定する。ＢＴＳの受信バッファの処理が入力データレートより遅く、バッファが許容可能な場合よりも速く満たされる場合、本発明によれば、ＢＴＳは、逆方向チャネルのデータレートを遅くするようにＭＳに通知する。ＢＴＳの受信バッファの処理が入力データレートより速い場合、ＢＴＳは、データレートを増大させるようＭＳに通知する。

【００２６】図３は、本発明の一実施例の流れ図を示す。まず、ブロック３００で、ＢＴＳ（例えば図１のＢＴＳ１０４）とＭＳ（例えば図１のＭＳ１０６）の間に通信リンクを確立する。この通信リンクは、ネットワークへのアクセスを要求するＭＳによって、または、ユーザがネットワークに入ることが要求されていることをＢＴＳがＭＳに通知することによって、開始されることが可能である。通信リンクが確立された後、ＢＴＳは、まず、低速ＤＣＣＨまたは基本チャネルのいずれかを用いてデータ伝送ストリームを確立する。ブロック３０５で、アクティブデータセッション中に、ＢＴＳは、順方向チャネル上および逆方向チャネル上のデータレートをモニタする。次に、モニタ機能の結果がブロック３１０の判定機能に送られる。ブロック３１０で、モニタされた順方向リンクのパラメータ値を、所定のしきい値と比較する。順方向リンクのモニタ値がしきい値以内にある場合、順方向リンクは許容可能な限界内で動作しており、順方向リンクについては調整の必要がないため、動作はブロック４１０の逆方向リンクの処理に進む。そうでない場合、順方向リンクは許容可能な限界内で動作しておらず、データレートの調整をしなければならないため、動作はブロック３２０に進む。

【００２７】ブロック３２０で、実際のデータレートをチャネルデータレートと比較する。チャネルデータレートが実際のデータレートに比べて遅すぎる場合、チャネルデータレートを増大させるために、動作はブロック３３０に進む。そうでない場合、チャネルデータレートを減少させるために、動作はブロック３５０に進む。

【００２８】ブロック３３０で、データリンクの現在の状態の検査を実行して、リンクが既に最大容量で動作してないかどうかを確認する。リンクが最大レートで動作している場合、順方向リンク上のレートをこれ以上増大させることは不可能であるため、動作はブロック４１０に進む。一方、チャネルのデータレートの増大が可能である場合、動作はブロック３４０に進む。ブロック３４０で、ＤＣＣＨ、基本チャネルまたは補助チャネルによって、より高いデータレートを選択し割り当てる。この高いデータレートに対応するしきい値レベルもこのときに割り当てることが可能である。

【００２９】ブロック３５０で、データリンクの現在の状態の検査を実行して、リンクが既に最小容量で動作してないかどうかを確認する。リンクが最小レートで動作している場合、順方向リンク上のレートをこれ以上減少させることは不可能であるため、動作はブロック４１０に進む。一方、リンクが最小レートで動作しているのではなく、データレートをさらに減少させることが可能である場合、動作はブロック３６０に進む。

【００３０】ブロック３６０で、適当なチャネル（ＤＣＣＨ、基本チャネルまたは補助チャネル）によって、より低いデータレートを選択し割り当てる。この低いデータレートに対応するしきい値レベルもこのときに割り当てることが可能である。

【００３１】ブロック４１０で、本発明は、順方向リンクについて説明したのと同様にして逆方向リンクについて動作する。逆方向リンクのデータレートが遅すぎる場合、ＢＴＳは、データレートを増大させるようＭＳに指示する。逆方向リンクのデータレートが高すぎる場合、ＢＴＳは、データレートを減少させるようＭＳに指示する。

【００３２】順方向リンクおよび逆方向リンクについての動作が完了すると、動作はブロック５００に進み、順方向リンクおよび逆方向リンクのモニタリングを、ネットワーク内の各アクティブユーザについて繰り返す。

【００３３】本発明の第２実施例では、ＭＳは、ＭＳからＢＴＳへの送信を待機しているデータの量に関して、モニタ機能を実行することが可能である。予想されるバッファのオーバーフローまたはアンダーフローの条件が発生すると、ＭＳからＢＴＳへ情報信号が送られ、この信号からＢＴＳは、逆方向リンクにおけるデータレートの調整を行う。この実施例では、アンダーフロー／オーバーフロー信号をＢＴＳへ送るべきときを決定するためにＭＳのバッファ管理機能によって使用されるしきい値を、事前にまたは動的に、ＭＳに与えることが可能である。順方向リンクのモニタ機能と同様に、このしきい値は、使用されるデータレートに対応する。

【００３４】このように、本発明は、与えられたデータサービスに割り当てられる帯域幅／パワーレベルを、ソースによって要求される実際のデータレートに動的に調整する新規な方法を提供する。

【００３５】

【発明の効果】［結論］本発明は、ユーザの要求を満たすのに必要かつ十分な最小限のデータレートをユーザに提供するように、通信チャネルのデータレートを動的に適応させる新規な手段を提供する。このような最小限のデータレートを割り当てることにより、基地局は、各ユーザとの通信リンクを維持するための出力パワーの消費を低くし、ユーザあたりに消費されるパワーを低くすることが可能であり、ユーザを追加するための容量が増大する。

【図面の簡単な説明】

【図１】本発明の方法が使用されるワイヤレス通信システムの代表的な構造を示す図である。

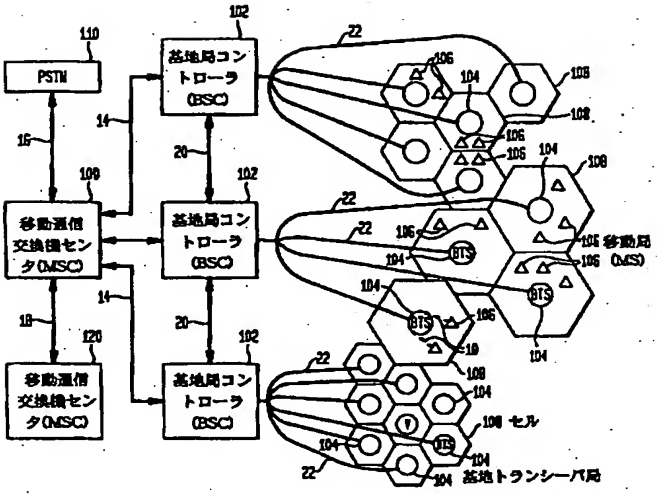
【図２】本発明が使用されるワイヤレスシステムにおける順方向チャネルのフォーマットを示す図である。

【図３】本発明の実施例を表す流れ図である。

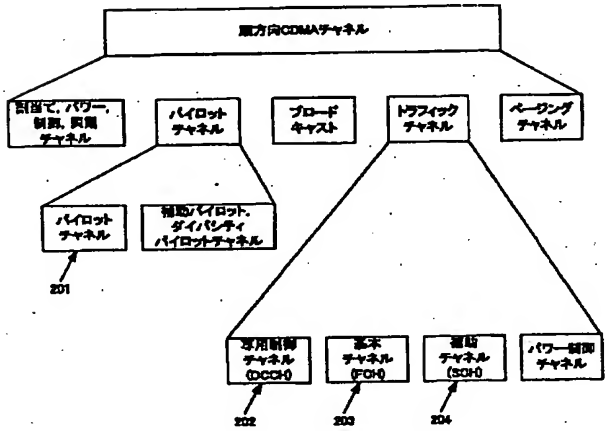
【符号の説明】

１００　移動通信交換機センタ（ＭＳＣ）
１０２　基地局コントローラ（ＢＳＣ）
１０４　基地トランシーバ局（ＢＴＳ）
１０６　移動局（ＭＳ）
１０８　セル
１１０　ＰＳＴＮ
１２０　ＭＳＣ
２０１　パイロットチャネル（ＰＣＨ）
２０２　専用制御チャネル（ＤＣＣＨ）
２０３　基本チャネル（ＦＣＨ）
２０４　補助チャネル（ＳＣＨ）

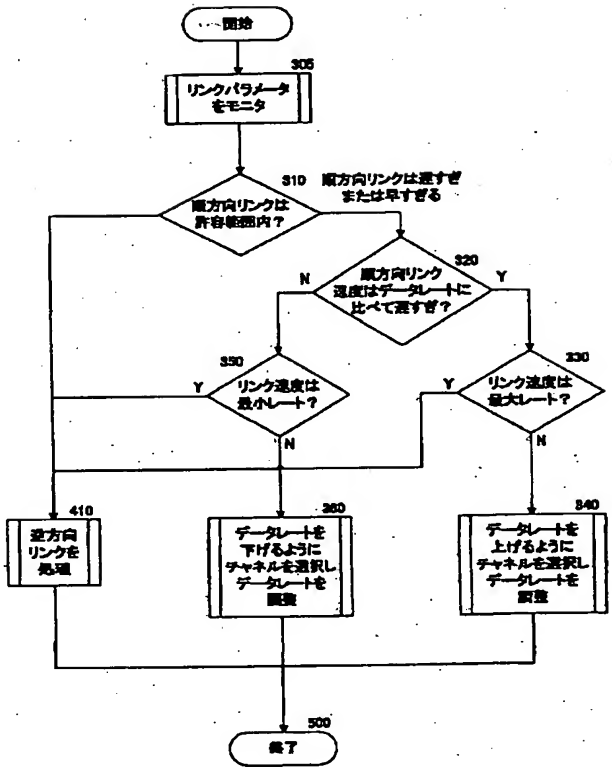
【図１】


PSTN
基地局コントローラ (BSC)
移動通信交換機センタ(MSC)
移動局 (MS)
BTS
セル
基地トランシーバ局

【図２】


順方向CDMAチャネル
パイロットチャネル
ブロードキャスト
トラフィックチャネル
ページングチャネル
パイロットチャネル
補助パイロット、ダイバシティパイロットチャネル
専用制御チャネル (DCCH)
基本チャネル (FCH)
補助チャネル (SCH)
パワー制御チャネル

【図３】


開始
リンクパラメータをモニタ
順方向リンクは許容範囲内？
順方向リンクは遅すぎまたは早すぎる
順方向リンク速度はデータレートに比べて遅すぎ？
リンク速度は最小レート？
リンク速度は最大レート？
逆方向リンクを処理
データレートを下げるようにチャネルを選択しデータレートを調整
データレートを上げるようにチャネルを選択しデータレートを調整
終了

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【手続補正書】
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【手続補正１】
【補正対象書類名】明細書
【補正対象項目名】特許請求の範囲
【補正方法】変更
【補正内容】
【特許請求の範囲】
【請求項１】　基地局および少なくとも１つの移動局を有するワイヤレス通信システムにおいて、
前記基地局は、少なくとも１つの移動局との通信リンクを確立するように動作し、該通信リンクは複数のチャネルおよび複数のデータレートモードを有し、
ａ．データバッファ内のデータの測定値に基づいて、与えられたユーザに対する通信リンク上の伝送のデータレートを測定するステップと、
ｂ．前記与えられたユーザに対して、前記複数のデータレートモードのうちから、測定された通信リンクのデータレートをサポートするのに十分なデータレートを選択するステップとを有することを特徴とする、与えられたユーザに対する通信リンクにおけるデータレートモードを選択する方法。
【請求項２】　前記ステップａおよびｂは、前記データバッファの測定値の変化に基づいて、前記少なくとも１つのチャネルおよび選択されるデータレートを動的に調整するように、前記与えられたユーザについて反復されることを特徴とする請求項１に記載の方法。
【請求項３】　前記ステップａおよびｂは、前記システム内のほぼすべての移動局にわたり反復されることを特徴とする請求項１に記載の方法。
【請求項４】　前記通信リンクは順方向リンクを含み、該順方向リンクは制御チャネルおよびトラフィックチャネルを有し、該制御チャネルは、制御コマンドおよびトラフィックデータを伝送するように動作することを特徴とする請求項１に記載の方法。
【請求項５】　前記順方向リンクは、選択されるデータレートをサポートするのに十分な容量を有するように選択されることを特徴とする請求項４に記載の方法。
【請求項６】　前記通信リンクは逆方向リンクを含み、該逆方向リンクは制御チャネルおよびトラフィックチャネルを有し、該制御チャネルは、制御コマンドおよびトラフィックデータを伝送するように動作することを特徴とする請求項１に記載の方法。
【請求項７】　前記逆方向リンクは、選択されるデータレートをサポートするのに十分な容量を有するように選択されることを特徴とする請求項６に記載の方法。
【請求項８】　前記データバッファは、前記通信リンクを通じてデータを受信する入力データバッファを含むことを特徴とする請求項１に記載の方法。
【請求項９】　前記入力データバッファ内のデータの測定値は、既知のしきい値限界に対して決定されることを特徴とする請求項８に記載の方法。
【請求項１０】　前記しきい値限界は、前記複数のデータレートモードに対応する複数の所定のしきい値を含むことを特徴とする請求項９に記載の方法。
【請求項１１】　前記データバッファは、前記通信リンクを通じてデータを受信する出力データバッファを含むことを特徴とする請求項１に記載の方法。
【請求項１２】　前記出力データバッファ内のデータの測定値は、既知のしきい値限界に対して決定されることを特徴とする請求項１１に記載の方法。
【請求項１３】　前記しきい値限界は、前記複数のデータレートモードに対応する複数の所定のしきい値を含むことを特徴とする請求項１２に記載の方法。

【請求項１４】　前記通信リンクは、ＣＤＭＡ方式で確立されることを特徴とする請求項１に記載の方法。

【請求項１５】　少なくとも１つの基地局と、通信リンクを通じて該基地局と通信する少なくとも１つの移動局とを有するワイヤレス通信システムでチャネル容量を適応的に割り当てる方法において、

ａ．前記少なくとも１つの基地局と１つの移動局との間で前記通信リンクの低速チャネルでデータ通信ストリームを開始するステップと、

ｂ．前記データ通信ストリームのソースからデータバッファで受信されるデータレートを測定するステップと、

ｃ．複数のデータレートのうちから、測定されたデータレートをサポートするのに十分なデータレートを選択するステップと、

ｄ．選択されたデータレートを前記データ通信ストリームに割り当てるステップとを有することを特徴とする、ワイヤレス通信システムでチャネル容量を適応的に割り当てる方法。